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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT HOFNER and AMNON A. STRASSER

Appeal 2009-006271
Application 09/989,377[1]
Technology Center 2400

Decided: May 17, 2010

Before ROBERT E. NAPPI, MARC S. HOFF,
and ELENI MANTIS MERCADER, *Administrative Patent Judges*.

HOFF, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] The real party in interest is EXANET, Inc.

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from a final rejection of claims 1-38. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

Appellants' invention relates to a system and method for load balancing between redundant network resources in a network, wherein if one network resource fails, a computer within a terminal node transfers the tasks executing on the failed network resource to the redundant network resource. A connectivity medium connects the computer and the network resources, wherein there are at least two independent communication paths between the terminal node, the network resource, and the redundant matching resource. During normal system operation all resources equally share the probability of being used by the network, wherein the redundant matching resources have tasks assigned to them and do not sit idle. (Abstract; Spec. ¶¶ [0029]-[0031]).

Claim 1 is exemplary:

1. A system comprising:

at least one terminal node;

at least one network resource, said network resource having at least one redundant matching resource;

a computer that transfers tasks from execution on said network resource for execution on said redundant matching resource if said network resource fails, and that balances execution loads between the tasks executed by said network resource and the tasks executed by said redundant matching resource; and

a communication medium connecting said computer, said terminal node, said network resource and said redundant matching resource, said communication medium having at least two independent communication paths between said terminal node, said network resource and said redundant matching resource.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Petersen et al.	US 5,699,510	Dec. 16, 1997
Wolff	US 6,067,545	May 23, 2000
Richter et al.	US 2002/0107962 A1	Aug. 8, 2002

Claims 1-3, 5-7, 9, 10, 16, and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wolff in view of Petersen.

Claims 4, 8, 11-15, 17-20, 23-26, and 28-38 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wolff in view of Petersen and Richter.

Claims 21 and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wolff in view of Richter.

Rather than repeat the arguments of Appellants or the Examiner, we make reference to the Appeal Brief (filed Feb. 26, 2007), the Reply Brief (filed July, 1, 2008), and the Examiner's Answer (mailed May 2, 2008) for their respective details.

ISSUES

Appellants contend that neither Wolff nor Petersen disclose redundant resources that are assigned tasks in an effort to share the work load without running idle until a network resource fails (App. Br. 16). Appellants contend that although Wolff discloses remapping, Wolff fails to disclose two independent communication paths as recited in the claims (App. Br. 17). Appellants contend further that the mirrored resources of Petersen have identical data and tasks but the Appellants' invention enables different tasks to be assigned to a network resource and its redundant resource (App. Br. 18).

The Examiner finds that Wolff discloses redundant resources/servers, where the functions of the servers are the same and both access the same memory resource, making them repetitive (Ans. 18). The Examiner finds that Wolff discloses two independent paths 74 and 76 connected to respective servers 104A and 106A meeting the claim limitation of "[two] independent communication paths" (Ans. 19). The Examiner concludes that one would be motivated to combine the teachings of Wolff and Petersen to provide a fault tolerant environment and seamless failover (Ans. 20).

Appellants' contentions present us with the following three issues:

1. Does Wolff disclose balancing the execution of loads between the tasks executed on the network resource and the redundant matching resource?

2. Does Wolff disclose a communication medium between the terminal node, the network resource and the redundant matching resource having at least two independent communication paths?

3. Would one skilled in the art have been motivated to combine the teachings of Wolff and Petersen to provide a fault tolerant system and seamless failover?

FINDINGS OF FACT

The following Findings of Fact (FF) are shown by a preponderance of the evidence.

The Invention

1. According to Appellants, the invention relates to a system and method for load balancing between redundant network resources in a network, wherein if one network resource fails, a computer within a terminal node transfers the tasks executing on the failed network resource to the redundant network resource. A connectivity medium connects the computer and the network resources, wherein there are at least two independent communication paths between the terminal node, the network resource, and the redundant matching resource. During normal system operation all resources equally share the probability of being used by the network, wherein the redundant matching resources have tasks assigned to them and do not sit idle (Abstract; Spec. ¶¶ [0029]-[0031]).

Wolff

2. Wolff discloses client load rebalancing, distributed Input and Output (I/O) and resource load rebalancing. These embodiments allow more efficient, robust communication between a plurality of clients and a plurality of resources through a plurality of nodes. The remapping of paths through a plurality of nodes to a resource is conducted in an effort to optimize throughput between clients and the resources accessed by the nodes.

Resources can include but are not limited to computers, memory devices, imaging devices, printers and data sets. Nodes can include but are not limited to computers, gateways, bridges and routers. Clients can include but are not limited to: computers, gateways, bridges, routers, phones, and remote access devices (Figs. 1A-C; col. 4, ll. 34-60).

3. Wolff discloses that client load rebalancing refers to the ability of a client enabled with processes in accordance with the current invention to remap a path through a plurality of nodes to a resource. The remapping may take place in response to a redirection command emanating from an overloaded node, e.g. server. This capability allows the clients to optimize throughput between themselves and the resources accessed by the nodes. A network which implements this embodiment of the invention can dynamically rebalance itself to optimize throughput by migrating client I/O requests from over-utilized pathways to underutilized pathways (col. 4, ll. 49-60).

4. Wolff discloses that Servers 104B-106B respectively include complementary processes 104PB-106PB for handling concurrent I/O requests from either of clients 100A for a file system resource on memory resource 118 (col. 6, ll. 6-17)

5. Wolff discloses that for client load rebalancing, servers 104A-106A are both connected through a network 108 to both the normal client 100A (using paths 70 and 72) and the aware client 102A (using paths 74 and 76). The network 108 may include any network type including but not limited to a packet switch local area network (LAN) such as Ethernet or a circuit switched wide area network such as the public switch telephone network (PSTN) (Fig. 1A, col. 5, ll. 15-22).

6. Wolff discloses that resource load rebalancing includes remapping of pathways between nodes, e.g. servers, and resources, e.g. volumes/file systems. Load rebalancing allows the network to reconfigure itself as components come on-line/off-line, as components fail, and as components fail back. Memory resource 118A includes configuration database 120A1-D1. The cluster configuration database includes: a clustered node database, a resource database, a directory/access table and a database lock. Memory resource 118A also includes a plurality of file systems generally 122A1-3 and associated directory and access tables. Memory resource 118B includes a plurality of file systems 122B1-3 and associated directory and access tables. Server 104C includes processes 104PC while server 106C includes processes 106PC. In the example shown, server 106C has twice the processing capability of server 104C (Fig. 1C; col. 7, ll. 34-57)

7. Wolff discloses that, in operation during resource load rebalancing, server 104C accesses file systems 122A2-3 through paths 90A, file system 122A1 through path 90B, and file systems 122B1-B3 through paths 90C. At time t=1, both servers 106C and 104C become operational. When server 106C comes on-line resident processes 106PC seize control of the configuration database 120A1-D1 by placing a lock in the lock portion 120-D1 of the database. While this lock is in place, any other server attempting to rebalance the resources will see that rebalancing is taking place by another server when it fails to obtain the lock. Server 106C thus becomes the temporary master of the resource rebalancing process. The master uses the configuration database records for all volumes, and active nodes to rebalance the system. Rebalancing the system takes into account:

preferred resource-server affiliations, expected volume traffic, relative server processing capability, and group priority and domain matches, all of which are contained in configuration database 120A1-B1. Optimal remapping between the existing servers 104C-106C and the available memory resources 118A-B is accomplished by processes 106PC. These results are replicated to each server's copy of the dynamic RAM resident configuration database 120A2-B2, the results are published and received by processes 104PC on server 104C, and the lock 120D1 is removed. Subsequent to the load rebalancing server 106C takes on responsibility for handling through path 92B I/O requests for file systems 122B1-B3. Further administrative access to these file systems through paths 90C from server 104C ceases. An additional path 92A between server 106C and file system 122A1 is initiated, while the path 90B between that same file system and server 104C is terminated (Fig. 1C, col. 7, l. 59-col. 8, l. 34).

8. Wolff discloses that resource load rebalancing can occur on demand, in response to a new node coming on line, in the event of system fail over and in the event of a fail back (Figs. 9A-E and 10B-D; col. 27, ll. 7-11).

Petersen

9. Petersen discloses that each memory 30 and 35 is a mirrored memory. As is well known in the art, mirrored memory simply means that data in one memory is duplicated or "mirrored" in another memory. The existence of dual controllers, and mirrored memory in each, provides a fault tolerant environment for disk storage system 10. Namely, in the event of a failure of one of the controllers, or one of the controller memory systems, the existence of the other controller and its mirrored memory provides a

seamless failover option for continued processing. In this context, communication occurs between controllers 20 and 25 to provide a cost effective real time link and to allow each controller to monitor the state of the duplicate controller and to coordinate activities (col. 2, ll. 65-col. 3, ll. 13).

PRINCIPLES OF LAW

On the issue of obviousness, the Supreme Court has stated that "the obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 419 (2007). Further, the Court stated "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *Id.* at 416. "One of the ways in which a patent's subject matter can be proved obvious is by noting that there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims." *Id.* at 419-420.

ANALYSIS

Claims 1-3, 5-7, 9, 10, 16, and 22

Independent claim 1 recites "a computer … that balances execution loads between the tasks executed by said network resource and the tasks executed by said redundant matching resource…[a] communication medium having at least two independent communication paths."

Independent claim 9 recites "a computer … that balances execution loads between the tasks executed by said plurality of network resources and

the tasks executed by said plurality of redundant resources…[a] communication medium having at least two independent communication paths."

Independent claim 16 recites "a plurality of redundant communication paths independent of said plurality of communication paths…assigning, for the purpose of an execution of the task, the least loaded of at least one network resource from said plurality of network resources or at least one matching redundant resource from said plurality of network resources to the request."

Appellants contend that neither Wolff nor Petersen disclose redundant resources that are assigned tasks in an effort to share the work load without running idle until a network resource fails (App. Br. 16, Reply Br. 5). Appellants contend that although Wolff discloses remapping, Wolff fails to disclose two independent communication paths as recited in the claims (App. Br. 17, Reply Br. 6). Appellants contend that the mirrored resources of Petersen have identical data and tasks but that Appellants' invention enables different tasks to be assigned to a network resource and its redundant resource (App. Br. 18). As such, Appellants contend that Wolff does not suggest load-balancing between a network resource and a matching redundant resource (Reply Br. 5 and 6). Appellants contend that in the case of one of the servers or processes failing, the system of Wolff does not suggest nor show that the task of one server is transferred to another server or process (Reply Br. 5). Appellants contend that combining load-balancing with mirrored systems would interfere with well-known functions of the mirrored systems (App. Br. 18). Appellants contend that one of ordinary skill in the art would not be motivated to combine the references since the

present invention goes beyond providing a fault tolerant system to providing techniques for using a network resource and its redundant network resource in a load-balanced fashion rather than leaving the redundant resource idling until a network resource failure (App. Br. 20).

The Examiner finds that Wolff discloses redundant resources/servers, where the functions of the servers are the same and both access the same memory resource, making them repetitive (Ans. 18). The Examiner finds that Wolff discloses two independent paths 74 and 76 connected to respective servers 104A and 106A meeting the claim limitation of "two independent communication paths" (Ans. 19, FF 5). The Examiner reiterates that he relies upon Petersen for disclosure of two controllers connected to one another, acting as a mirrored redundant resource, and not for load balancing as Appellants contend (Ans. 4). The Examiner concludes that one would have been motivated to combine the teachings of Wolff and Petersen to provide a fault tolerant environment and seamless failover (Ans. 20).

With reference to the first issue, we agree with the Examiner's finding that Wolff discloses resource load rebalancing (Ans. 20). Although the Examiner refers to the client load rebalancing portion of the invention disclosed in Wolff (FF 5), we find that the resource load rebalancing portion of Wolff clearly discloses balancing execution of loads between tasks executed by a network resource and another network resource (FF 6-8). Specifically, Wolff discloses that resource load rebalancing includes remapping of pathways between nodes, e.g. servers, and resources, e.g. volumes/file systems (FF 6). Load rebalancing allows the network to reconfigure itself as components come on-line/off-line, as components fail,

and as components fail back (FF 6). The resource load rebalancing disclosed in Wolff can occur on demand, in response to a new node coming on-line, *in the event of system fail over* and in the event of a fail back (FF 8).

With reference to the second issue, Wolff discloses that when server 106C takes on the responsibility for handling requests for file systems 122B1-B3, through path 92B, the access to these file systems *through path 90C* from server 104C *ceases* (FF 7). Wolff discloses further that an additional path 92A between server 106C and file system 122A1 is initiated, while *the path 90B* between that same file system and server 104C is *terminated* (FF 7).

Clearly, Wolff discloses load balancing between resources and at least two independent communication paths, 92A and 92B, between terminal node 106 and network resource 122 B1-B3 and second network resource 122 A1-A3 (FF 7).

The Examiner relies upon Petersen for redundancy of network resources in addition to those disclosed in Wolff to provide a seamless failover option for continued processing, wherein the tasks assigned to one resource is transferred to be executed on the redundant network resource in the event of failure of one of the network resources (Ans. 4 and 20; FF 9).

We find that one skilled in the art would be motivated as disclosed in Wolff and Petersen to combine the references to implement a network that can dynamically rebalance itself to optimize throughput by migrating client I/O requests from over-utilized pathways to under-utilized pathways (FF 3) and to create a fault tolerant system (FF 9). Wolff's goal is to allow more efficient, robust communication between a plurality of clients and a plurality of resources through a plurality of nodes (FF 2). We agree with the

Examiner's finding that adding the resource redundancy disclosed in Petersen would further enhance Wolff's goal of providing a fault tolerant environment with seamless failover (Ans. 4 and 20).

We find that the combination of Wolff and Petersen discloses all the limitations of independent claims 1, 9, and 16. Thus, we do not find error in the Examiner's rejection of claims 1-3, 5-7, 9, 10, 16, and 22 under 35 U.S.C. § 103(a) as unpatentable over Wolff in view of Petersen, and we will affirm the rejection.

Claims 4, 8, 11-15, 17-20, 23-26, and 28-38

As noted *supra*, we sustain the rejection of independent claims 1, 9 and 16 from which claims 4, 8, 11-15, 17-20, and 23-26 depend and having similar claim limitations to that of independent claim 28 and dependent claims 29-38.

Independent claim 28 recites "at least two network switches providing alternate connection paths to said client node, said connection paths being independent from each other…at least two cache control nodes…capable of load balancing storage control nodes."

Appellants contend that Richter does not cure the deficiencies of Wolff and Petersen (App. Br. 23). As Appellants have not persuaded us of any deficiencies in the rejection of Wolff and Petersen, we sustain the Examiner's rejections of claims 4, 8, 11-15, 17-20, 23-26, and 28-38 under 35 U.S.C. § 103, for the same reasons expressed with respect to the § 103 rejection of claims 1, 9, and 16, *supra*.

Claims 21 and 27

Appellants contend that the combined teachings of Wolff and Richter do not disclose that "the load is redistributed between the remaining

communication paths and the remaining independent redundant communication paths," as recited in independent claims 21 and 27 (App. Br. 22). Appellants contend that one skilled in the art would not have been motivated to combine the references (App. Br. 22). Thus, Appellants arguments directed to this rejection present us with the same issues as discussed with respect to independent claims 1, 9 and 16.

As noted *supra*, we sustain the rejection of independent claims 1, 9, and 16 having similar claim limitations to that of independent claims 21 and 27. Specifically, we found *supra* that Wolff discloses resource load rebalancing wherein the tasks assigned are redistributed from one resource 118A and its file systems 122A1-A3 to another resource 118B (through paths 90A and 90B) and its file systems 122B1-B3 (through paths 92A and 92B) (FF 6-8). Therefore we sustain the Examiner's rejections of 21 and 27 under 35 U.S.C. § 103, for the same reasons expressed with respect to the § 103 rejection of claims 1, 9, and 16, *supra*.

CONCLUSIONS OF LAW

Wolff discloses balancing the execution of loads between the tasks executed on the network resource and the redundant matching resource.

Wolff discloses a communication medium between the terminal node, the network resource and the redundant matching resource having at least two independent communication paths.

One skilled in the art would be motivated to combine the teachings of Wolff and Petersen to provide a fault tolerant system and seamless failover.

ORDER

The Examiner's rejection of claims 1-38 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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